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ITALIE

Date of mailing (day/month/year) 19 May 2000 (19.05.00)	
Applicant's or agent's file reference pct 2182	**IMPORTANT NOTIFICATION**
International application No. PCT/IT99/00085	International filing date (day/month/year) 09 April 1999 (09.04.99)
International publication date (day/month/year) 11 May 2000 (11.05.00)	Priority date (day/month/year) 02 November 1998 (02.11.98)
Applicant SYSTEAM S.P.A. et al	

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02 Nove 1998 (02.11.98)	RM98A000686	IT	03 May 2000 (03.05.00)

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REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

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Box No. I TITLE OF INVENTION An automatic device for the delivering of video signals, with a high capacity optical disks record

Box No. II APPLICANT

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

SYSTEAM S.p.a.
via degli Eroi di Cefalonia 37
00128 Roma
Italy

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State *(that is, country)* of nationality: Italy

State *(that is, country)* of residence: Italy

This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

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CARAMICO Luigi
via degli Eroi di Cefalonia 37
00128 Roma Italy

This person is:

☐ applicant only

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MASCIOLI Alessandro
via Urbana 20
00184 Roma
Italy

Telephone No. 064883232

Facsimile No. 064883232

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MENE' Mario
via degli Eroi di Cefalonia 37
00128 Roma
Italy

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Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is: national application: country	regional application:* regional Office	international application: receiving Office
item (1) 02.11.98 2 November 1998	RM98A000686	ITALY		
item (2)				
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Choice of International Searching Authority (ISA) *(if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):*
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Box No. VIII CHECK LIST; LANGUAGE OF FILING

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request	:	4
description (excluding sequence listing part)	:	12
claims	:	3
abstract	:	1
drawings	:	2
sequence listing part of description	:	
Total number of sheets	:	22

This international application is **accompanied by** the item(s) marked below:

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Figure of the drawings which should accompany the abstract: 1

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Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

Alessandro MASCIOLI

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1. Date of actual receipt of the purported international application: 534 Rec'd PCT/PTO 03 JUL 2000
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(71) Applicant *(for all designated States except US)*: SYSTEAM S.P.A. [IT/IT]; Via degli Eroi di Cefalonia, 37, I–00128 Roma (IT).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: CARAMICO, Luigi [IT/IT]; Via degli Eroi de Cefalonia, 37, I–00128 Roma (IT). MENE', Mario [IT/IT]; Via degli Eroi di Cefalonia, 37, I–00128 Roma (IT).

(74) Agent: MASCIOLI, Alessandro; Via Urbana, 20, I–00184 Roma (IT).

(81) Designated States: JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

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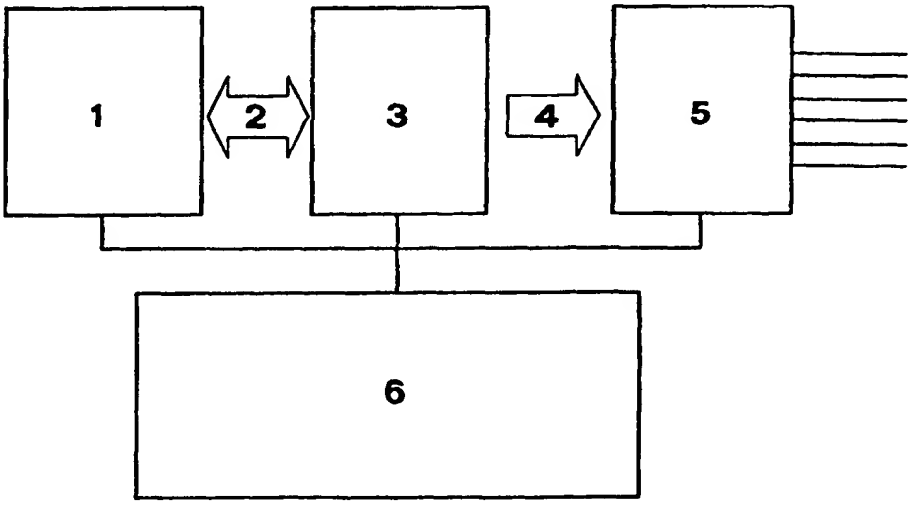
(54) Title: AN AUTOMATIC DEVICE FOR THE DELIVERING OF VIDEO SIGNALS, WITH A HIGH CAPACITY OPTICAL DISKS RECORD



(57) Abstract

The automatic device for the delivering of video signals with a high capacity optical disks record comprises a robotized system (1) for the running of DVDs (2), responsible for the recording of films to be broadcasted and of their loading into readers DVD (3) which transfer the content (4) of the DVDs – a film in MPEG2 format for each DVD – towards the output module (5) consisting of cards which, according to the use of the outlets, multiply a plurality of MPEG flows into one or more transport stream MPEG 2 in accordance with the specifications of Digital Video Broadcasting or transform each MPEG flow into a corresponding standard analogic outlet (compound, component or digital non–compressed signal D1), while the check system (6) cordinates the operations of the different components of said system and realized an interface with possible other scheduling or check systems.

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"AN AUTOMATIC DEVICE FOR THE DELIVERING OF VIDEO SIGNALS, WITH A HIGH CAPACITY OPTICAL DISKS RECORD"

The present invention concerns an automatic device for the delivering of video signals with a high capacity optical disks record.

It is known that at present all video servers are founded on the rigid disks technology and consider a structure comprising a computer provided with a BUS with high services that allows the passage of a considerable quantity of data. The storage units are usually based on high speed hard disk systems SCSI and the informations (in this particular case, the films codified according to the MPEG-2 standard) are stored on disks according to the "striping" technique. The present video servers are provided with input/output interfaces, for being compatible with the other television broadcasting apparatuses, typical for the television broadcast ambient (compound analogic signal, components or non compressed digital D1).

The use of above mentioned video server systems for realizing services of the NVOD kind shows considerable disadvantages:

- the cost: first of all, the storage of a considerable quantity of video films requires a great space and this affects the extremely high costs of the present systems that make use of hard-disks as a storage support;

- slow loading and updating of the contents: the need of reducing the costs within reasonable limits requires the need of dimensioning the vide servers in such a way as to contain only those films that are to be broadcasted, storing all other films onto a tape and performing the loading thereof only when they are to be used. The loading of films from a tape is very long and may be compared to the duration of the films to be loaded. This is due to the speed of the tape supports as well as to the storage technique on hard-disks as well as to the need of not to interfere with the broadcasting of the films that are stored on the same hard-disks and which therefore must be read before the writing process of the new film. This last problem, infact, limits the number of the films that may be contemporarily loaded, to one or maximum two films; consequently, the updating of the content of the whole server may also last a plurality of days;
- rigidity of use: a direct consequence of the slowness in updating the contents is the lack of felxibility in the composition of the NVOD channels programming, which necessarily are limited in proposing again also for long periods the same programming without the possibility of proposing a more efficient commercial policy or responding in a more appropriate way to the requests of the users. Due to the limited capacity of the storage technique, besides the slow loading, it is necessary to observe a rather rigid mix in the composition of the NVOD offer. A server that generates 50 outlets, e.g., can not send the same , very requested film on all 50 outlets, but a plurality of copies of saod film must be loaded. The same, it is impossible to send 50 different films

each on one of the 50 different outlets, due to the limited capacity of the video server;

- analogic outlet: the use of conventional video servers in digital broadcasting ambients, where the signal is sent in MPEG-2 format, has the further disadvantage that it requests a real time encoder MPEG-2 for each outlet, in addition to a number of multiplex depending from the number of channels to be broadcasted. These apparatuses are enormously expensive.

It is the aim of the present invention to supply a determined number of video outlets (analogic, digital, MPEG2) independent one from the other ad corresponding to the content of as much DVD loaded in the readers.

The aim set forth is reached by means of the device according to the present invention, that makes use of DVD disks as a support for the storage of the films, while the different storage technology used allows to solve the problems shown by the conventional video servers when they are used for the realization of a NVOD service.

The device according to the present invention solves the disadvantages of the conventional servers and shows further advantages:

- inexpensiveness: the use of the DVD technology for the storage of the films to be broadcasted allows a cosiderable saving with respect to the magnetic disks. This allows to realize systems with

a much greater capacity than the one of the systems based on hard-disks, and thus to solve the problems arising from a reduced capacity;

- quick loading of the contents: the capacity of the robotized record may reach 10,000 DVD, maintaining a maximum loading time of the DVD inside the readers of 7 seconds. Even without reaching such dimensions of the record, it is however possible to automatically update the content, replacing up to 100 DVD contemporarily in less than one hour;
- flexibility of use: the possibility of having in line an enormously greater number of films than the one used for broadcasting, together with the possibility of very quickly updating the content of the record, allow to realize extremely flexible programming and, when the number of users is not very high, also makes possible VOD-like applications. The record composition mix may be quickly adapted to the requests of the users by loading a plurality of copies of the most requested films;
- analogic and/or digital outlet: the proposed system may supply - according to the utilization ambient - a standard analogic outlet or a non-compressed digital one, as well as - in case of digital television - directly supply in output a compressed digital outlet MPEG-2 in singles or multiple program transport stream format, according to the DVB standard. This latter outlet allows to eliminate the need of the real time encoders MPEG-2, allowing further saving;
- a modular and expandible architecture: the structure of the proposed system is extremely modular and may be fitted from

time to time to the needs of the user, choosing the capacity of the record, the number of the readers, the number ad the kind of the outlet cards. These parameters may also be modified in time for getting fitted to new arising needs.

The present invention will be described more in detail realting to the enclosed drawings in which an embodiment is shown.

Figure 1 shows a block scheme of an automatic device for the delivery of video signals with high capacity optical disks record, according to the present invention.

Figure 2 shows a functioning scheme.

Figure 3 shows a digital outlet module, while figure 4 shows an analogic outlet module.

The enclosed figures show a device based on a robotized system 1 for managing a DVDs 2, responsible for the recording of films to be broadcasted and of their loading in DVD 3 readers which transfer the content 4 of the DVDs - a film in MPEG-2 format for each DVD - towards an output module 5 consisting of cards which, according to the use of the outlets, multiple a plurality of MPEG flows into one or more transport stream MPEG2 in accordance with the specifications of Digital Video Broadcasting, or transform each MPEG flow into a corresponding standard

analogic outlet (compound, component or digital non compressed signal D1), while the check system 6 coordinates the operations of te different components of said system and realized an interface with possible other scheduling or check systems.

In the schemes shown in figures 2, 3 and 4, the following details are shown in addition to the ones already mentioned:

- a robot 7;
- a system for the mechanical transfer 8;
- an outlet 9 for the high speed video net data systems;
- a control inlet 10 from external systems; outlet of the state signals;
- a data net 11 of the kind TCP/IP;
- a system 12 for managing the high speed signal;
- a devider commutator 13 of the sent signals;
- an converter 14 of the sent signals to the features defined by the checking units;
- a unit 15 for the recombination of the signal (MUX);
- an inlet 16 from readers DVD;
- an outlet signal 17 towards the broadcasting apparatuses; digital video signal in MPEG-2 format;
- an inlet/outlet 18 of the checking signals coming from the central control and checking system;
- control data 19 onto the status of the system, sent to external monitoring systems;
- a unit 20 for decoding the digital MPEG-2 signal;
- an analogic outlet unit 21;

- an outlet signal 17' from the broadcasting apparatuses.

In the following, the functions of the blocks composing the system will be described more in detail: a robotized system 1 for managing DVD 2, responsible for the recording of the films to be broadcasted and for their loading in the DVD 3 readers which transfer the content 4 of the DVDs - a film in MPEG2 format for each DVD - towards the output module 5 consisting of cards which, according to the use of the outlets, multiple a plurality of MPEG flows into one or more transport stream MPEG2 in accordance with the specifications of Digital Video Broadcasting, or transform each MPEG flow into a corresponding standard analogic outlet (compound, component or digital non compressed signal D1), while the check system 6 coordinates the operations of te different components of said system and realized an interface with possible other scheduling or check systems.

- A robotized record DVD 1, that stores and mechanically manipulates a great number of DVD disks (up to 10,000). The use of this system eliminates all manual operations of loading from cassettes or tapes, with a consequent saving of time and money.

- DVD 3 readers, automatically managed by the control system 6, that allow to read the content of the DVDs and to transfer the same towards the outlet cards. The films are recorded on DVDs in single program transport stream format according to the DVB

specifications, and therefore the outlet data flow contains the video in MPEG2 format, one or more audio channels linked thereto and possible teletext or data channels.

- An outlet module 5 that integrates in a suitable way the cards for a non-compressed analogic/digital-like outlet and cards of the standard multiplex MPEG2 DVB kind.

- Cards for a non-compressed analogic and digital outled, which convert the flow coming from the DVD readers into a standard television signal of the kind of PLA or NTSC, according to the features of the recorded video. The outlet of the card may be synchronized with other video signal sources (genlockable) and is usually supplied in compound, as an optional in components and in non-compressed digital.

- A card for digital MPEG-2 outlet, that doesn't convert the flow MPEG-2 coming from the readers, but combines a plurality of flows containing one single film (single program transport strean) into one single outlet flow containing all films (multiple program transport stream). The outline of the card and the combinations of the flows are managed by the control system, according to the needs of the user. The outlet flow is supplied in a LVDS or ASI interface, as specified by the DVB standard.

- A control system 6, that controls and synchronizes the functioning of all components of the system, having one single

external control interface. Therefore, the whole system is run through the control system, locally by means of a graphic interface or by a remote control on a serial or network interface. The control system has a record for storing the content of the DVDs present in the system so as to perform its control and coordination functions. Said record is automatically updated each time DVDs are loaded or cancelled from the system. Said record allows the search of the titles for broadcasting: once the titles is selected, the corresponding DVD in loaded in the reader. From this moment on the title may be broadcasted in outlet through the output cards. Also more complex operations are possible, like fast forward, pause, slow motion, fast backward, positioning to a specific time-code.

In consideration of the fact that, as above mentioned, the aim of the system is to supply a plurality of video outlets, of different kinds, independent one from the other and corresponding to as much DVDs loaded in the readers, the presence of further surrounding functions seems to be required for realizing this particular function, and they are grouped according to their single components as follows:

- robotized DVD 1 record: it has an external interface and all running and monitoring functions are run by the control system:
  - general outline and calibration;
  - communication about the status of the system;
  - loading of new DVDs into the robotized record;

- cancelling of DVDs from the robotized record;
- list of DVDs present;
- status of DVDs present;
- positioning of the DVD X in the reader Y;
- number of disks present;
- number of hours used;
- entry statistics;

- readers DVD 3, which don't have an external interface, and wherein all running and monitoring functions are managed by the control system, having the following functions:
  - play
  - stop
  - pause
  - fast forward / backward
  - slow motion
  - repeat
  - opening of loading wing
  - closing of loading wing
  - communication about the status of the system;
- an outlet module 5 that integrates in a suitable manner the outlet cards of the non-compressed analogic/digital kind and of the standard multiplex MPEG2 DVB kind.

  The functions performed by the different kinds of card are:
  - cards for non compressed analogic and digital outlet;
  - conversion of the flow from reader X onto a compound outlet;
  - conversion of the flow from reader X onto components outlet;
  - conversion of the flow from reader X onto digital outlet;

- comunication about the status of the system;
- cards for MPEG-2 outlet
  - inlet flow selection
  - definition of the parameters for the inlet flows
  - definition of the parameters for the outlet flow
  - communication about the status of the system;
- a control system 6 that manages and synchronizes the functioning of all components of the system and that has one single external interface; consequently, the control system must be able to send all orders relative to the functions available in the different under-systems and possibly to translate the orders coming from outside into orders intelligible by said under-systems. E.g.: an order coming from outside might be: 'You will send film X to outlet Y'. This order must be converted in the following sequence of controls:
  - search of film X
  - open the door of reader Z
  - load the relative DVD into said reader Z
  - close the door of reader Z
  - play reader Z
  - select input Z onto outlet Y.

  For performing this complex function, the control system must also be able to run and to signal possible error situations due to bad working or to wrong orders.

  The main functions of the control system are:
  - search of the titles
  - updating of the contents of the record

- outline of the different under-systems
- control and communication about the status of the different under-systems
- control and communication about its own status
- interpretation of the orders from interface of local control
- interpretation of the orders from interface of remote control by means of serial
- interpretation of the orders from interface of remote control by means of LAN network
- performing of the program for locale interface.

CLAIMS

1. An automatic device for the delivery of video signals with a high capacity optical disks record, ***characterized in*** a robotized system (1) for running DVDs (2) responsible for the recording of the films to be broadcasted ad of their loading into the readers DVD (3), which transfer the content (4) of theh DVDs - a film in MPEG2 format for each DVD - towards the output module (5) consisting of cards which, according to the use of the outlets, multiple a plurality of MPEG flows into one or more transport stream MPEG2 in accordance with the specifications of Digital Video Broadcasting, or transform each MPEG flow into a corresponding standard analogic outlet (compound, component or digital non-compressed signal D1), while the check system 6 coordinates the operations of te different components of said system and realized an interface with possible other scheduling or check systems.

2. A device according to claim 1, ***characterized in*** a robotized record DVD (1) for storing and mechanically manipulating a great number of DVD disks (up to 10,000); the use of said system eliminates all manula loading operations from cassettes or tapes with the consequent saving of time and money.

3. A device according to claim 1, ***characterized in*** a plurality of readers DVD (3), automatically run by said control system (6) and which allow to read the content of the DVDs and to transfer the same towards the outlet cards; the films are stored onto DVD in

single program transport stream format according to the specifications of DVB, and therefore the outlet data flow contains the video in MPEG2 format, with one or more audio channels linked thereto and possible teletext or data channels.

4. A device according to claim 1, ***characterized in*** an outlet module (5) which suitably integrates the non-compressed analogic/digital kind outled cards and the standard multiplex MPEG2 DVB-like cards.

5. A device according to claim 1, ***characterized in*** a plurality of cards for non-compressed analogic and digital outlet, which convert the flow coming from DVD readers into a standard television signal of the kind PAL or NTSC, according to the features of the stored video; the outlet of the card may be synchronized with other sources of the video signal (genlockable) and is usually supplied in compound, as an optional in components and in non-compressed digital.

6. A device according to claim 1, ***characterized in*** a card for digital outlet MPEG-2, that does not convert the MPEG-2 flow coming from the readers but combines a plurality of flows containing one single film (multiple program transport stream); the outline of the card and the combination possibilities of the flows are run by the control system, according to the needs of the user; the outlet flow is supplied on LVDS or ASI interface, as it is specified in the DVB standard.

7. A device according to claim 1, ***characterized in*** a control system (6) that manages and synchronizes the functioning of all components of the system and that has one single external control interface; therefore, the whole system is run by the control system, locally by means of a graphic interface and in remote control by sending orders onto a serial or network interface; the control system has a record for storing the content of the DVDs present in the system, for perorming its functions of control and coordination; said record is automaticaly updated each time DVDs are loaded or cancelled from the system; furthermore, said record allows the search of the titles for broadcasting: once a title has been selected, the corresponding DVD is loaded into the reader; from this moment on, the title may be sent into outlet through the output cards; also more complicated operations are possible, like fast foward, pause, slow motion, fast backward and positioning to a determined time-code.

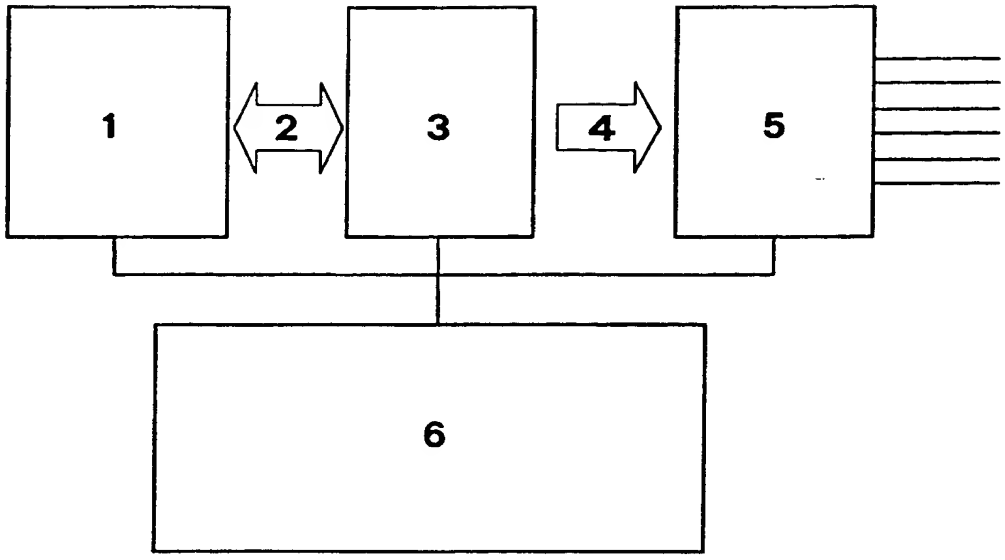

FIG.1

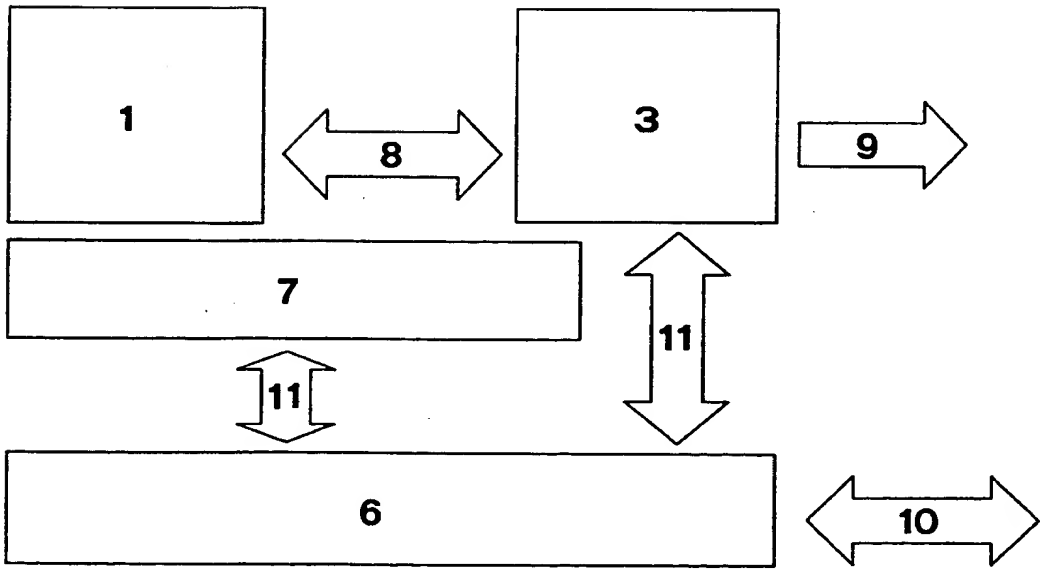

FIG.2

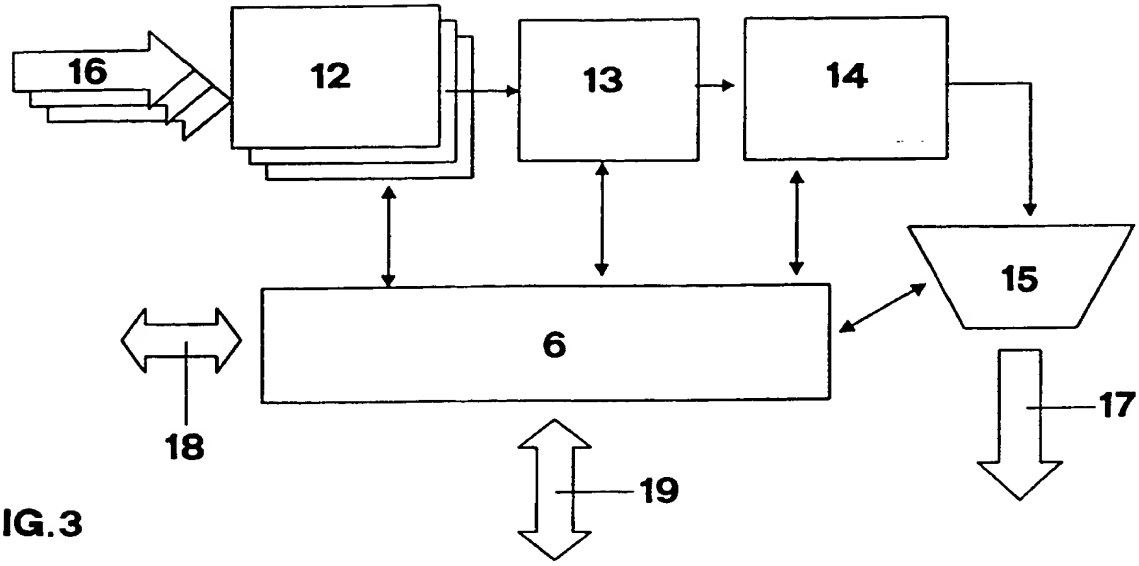

FIG.3

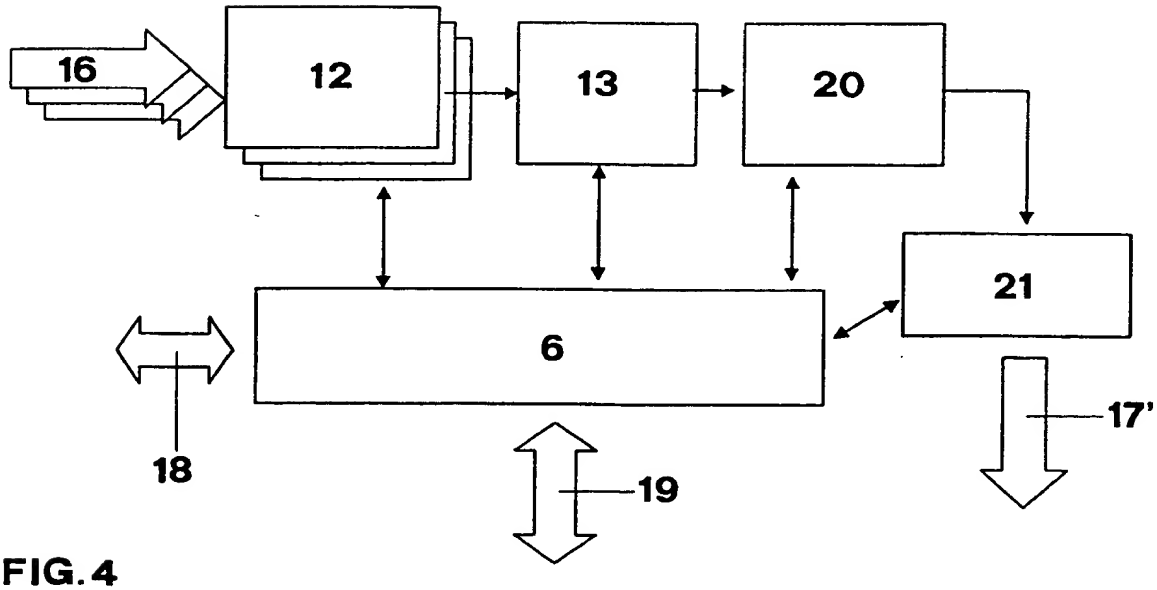

FIG.4

INTERNATIONAL SEARCH REPORT

nal Application No
PCT/IT 99/00085

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G11B27/00 H04N5/00 H04N7/173

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 G11B H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical. search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category ³	Citation of document, with indication, where appropriate. of the relevant passages	Relevant to claim No.
X	WO 97 35311 A (ALLEN RICHARD D) 25 September 1997	1,3-7
Y	see page 8, line 1 - line 19 see page 15, line 1 - line 31 see page 26, line 28 - page 27, line 7 see page 31, line 11 - line 26 see page 33, line 31 - page 34, line 24 see page 49, line 5 - page 52, line 3 ---	2
Y	PATENT ABSTRACTS OF JAPAN vol. 096, no. 005, 31 May 1996 & JP 08 008907 A (MATSUSHITA ELECTRIC IND CO LTD), 12 January 1996 see abstract ---	2
	-/--	

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

³ Special categories of cited documents :

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 June 1999	06/07/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Van der Zaal, R

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 774 709 A (MATSUSHITA ELECTRIC INDUSTRIAL CO.,LTD) 21 May 1997 see page 2, line 36 - line 43 see page 9, line 5 - page 11, line 57 see figures 1-7	1-7
A	US 5 652 614 A (OKABAYASHI ICHIRO) 29 July 1997 see column 3, line 51 - column 9, line 11 see figures 1-8	1-7

INTERNATIONAL SEARCH REPORT

Information on patent family members

[redacted]ial Application No
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WO 9735311 A	25-09-1997	AU 2335897 A	10-10-1997
		AU 2538397 A	10-10-1997
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EP 0774709 A	21-05-1997	JP 9198199 A	31-07-1997
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